

What we claim is:

1. A computer system for simulating a physical system comprising memory means, storage means, and object-oriented software in a main simulation system, said computer system further comprising:
 - 5 a) a logic interface that enables a user of the computer system to dynamically construct logic to customize simulation of the physical system;
 - b) means for converting the constructed logic into corresponding object-oriented code;
 - c) means for integrating the object oriented code with the main simulation
10 system which comprises a simulation data model and simulation algorithms, resulting in an integrated simulation system; and
 - d) means for executing the integrated simulation system.
2. The computer system of claim 1 wherein the constructed logic comprises facility management logic which is representative of steps for monitoring and
15 controlling mechanical facilities associated with the physical system.
3. The computer system of claim 1 wherein the logic interface comprises a logic flow chart interface.
4. The computer system of claim 3 wherein the logic flow chart interface comprises one or more of icons, arrows, menus, dialogs, toolbar buttons, and
20 text to enable a user of the computer system to build-up, edit and visualize facility management logic in the form of a flow chart.
5. The computer system of claim 3 wherein the logic flow chart interface comprises icons representing basic logic control constructs for looping, decision making, statement execution, and logic entry and exit.
- 25 6. The computer system of claim 5 wherein icons that represent logic control mechanisms enable a user of the computer system to construct customized logic flow charts.

7. The computer system of claim 1 wherein the logic interface comprises a text-based logic code interface.
8. The computer system of claim 7 wherein the text-based logic code interface comprises a graphical text editor for performing one or more of entering,
5 modifying and deleting lines of alpha-numeric text.
9. The computer system of claim 7 wherein the text-based logic code, which is a facility management control language, is capable of being automatically created from the logic flow chart.
10. The computer system of claim 9 wherein the facility management control language is capable of being automatically convertible into object oriented facility management code in the form of C++.
11. The method of claim 9 wherein the facility management control language is an object-oriented language with features and scope suited to embody facility management logic.
- 15 12. The computer system of claim 1 wherein the object oriented code is facility management object-oriented code in the form of C++.
13. The computer system of claim 1 wherein the logic interface enables a user of the computer system to develop logic using either a logic flow chart interface or a text-based logic code interface.
- 20 14. The computer system of claim 1 wherein the object-oriented code has the capability of extending the simulation data model by creating new classes that inherit from the simulation data model, thereby enabling the object-oriented code to call functions of the simulation data model and use member data of the simulation data model.
- 25 15. The computer system of claim 1 further comprises means for compiling the object-oriented code into object-oriented facility management object code and means for linking the facility management object code to produce shared libraries, thereby enabling loading of the shared libraries into the main simulation system.

16. The computer system of claim 1 further comprises means for compiling the object-oriented code into object-oriented facility management object code and means for linking the facility management object code to produce dynamic linked libraries, there by enabling loading of the dynamic linked libraries into the main simulation system.
17. The computer system of claim 1 being capable of executing the integrated simulation system by invoking the object oriented facility management code at a plurality of timesteps during the simulation.
18. The computer system of claim 17 wherein the object oriented facility management code is capable of returning control back to the main simulation system after the facility management code has finished executing for a current timestep.
19. The computer system of claim 1 comprises a plurality of connected processors to perform the simulation.
20. A method of simulating a physical system in a computer system comprising memory means, storage means, and object-oriented software in a main simulation system, the method comprising the steps of:
 - a) dynamically constructing logic to customize simulation of the physical system;
 - b) initiating simulation of the physical system causing initiation of the following steps:
 - i) automatically converting the logic into corresponding object-oriented code;
 - ii) integrating the object oriented code with the main simulation system which comprises a simulation data model and simulation algorithms, resulting in an integrated simulation system for simulating the physical system; and
 - iii) executing the integrated simulation system to simulate the physical system.

21. The method of claim 20 wherein the physical system comprises a hydrocarbon-bearing subterranean formation.
22. The method of claim 21 wherein the physical system comprises fluid-containing facilities associated with production of hydrocarbons from the hydrocarbon-bearing subterranean formation.
- 5 23. The method of claim 20 wherein construction of the logic comprises using a graphical user interface to perform at least one step chosen from:
 - a) selecting and using an existing logic;
 - b) selecting and modifying existing logic; and
 - 10 c) developing new logic.
24. The method of claim 23 wherein construction of the logic produces a logic flow chart.
25. The method of claim 23 wherein construction of the logic produces a text-based logic code.
- 15 26. The method of claim 24 wherein construction of the logic flow chart comprises using one or more of icons, arrows, menus, dialogs, toolbar buttons, and text to enable a user of the computer system to build-up, edit and visualize facility management logic in the form of a flow chart.
27. The method of claim 25 wherein the construction of the logic flow chart comprises using text-based logic code interface comprising a graphical text editor useful for entering, modifying and deleting lines of alpha-numeric text.
- 20 28. The method of claim 20 wherein the conversion of the logic is to C++ code.
29. The method of claim 20 wherein the converted object-oriented code has the capability of extending the simulation data model by creating new classes that inherit from the simulation data model, thereby enabling the object-oriented code to call functions of the simulation data model and use member data of the simulation data model.
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30. The method of claim 20 wherein execution of the initiated simulation system generates results for predicting the overall behavior of the physical system.
31. The method of claim 20 wherein execution of the initiated simulation system is carried out using a plurality of connected processors.